Philoponus, Kant, and Russell on the Beginning of Time

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Bertrand Russell presented an influential critique of Philoponus's traversal argument for a beginning of time in its Kantian form. I consider his criticisms and point out that they rely on metaphysical claims about the nature of time, causation, and the scope of non-contradiction. They are not merely logical criticisms. Russell relies on a Platonic atomist metaphysics to defend those claims. Yet, as I also point out, that metaphysics is not obviously true and Russell's arguments for it are weak. Russell often talks as if his metaphysics arises out of merely logical considerations. However, his metaphysics cannot be justified by logic alone. I conclude that the traversal argument survives Russellian criticism.[1]

Introduction

In 529 CE John Philoponus (Ioannis Philoponos) presented an influential argument for the claim that time must have had a beginning. In the eighteenth century, Immanuel Kant revived and modified that argument.[2] Today, Philoponus's argument is widely thought to be invalid. Modern criticisms usually state or build on criticisms put by Russell against Kant's

[1] I would like to thank Chris Mortensen and Paul Oppenheimer for helpful comments on an earlier draft of this paper.

[2] For Kant, the traversal argument is part of one side of an antinomy of pure reason; a pair of apparently sound arguments for opposite conclusions that rely on the fundamental metaphysical principles we legitimately use to interpret parts of our world, but we use illicitly when we deal with our world as a whole (Wood, 2010). He wants to argue that reason reaches its limits of coherence when it attempts to tackle questions such as the infinity or finitude of time. He is also focussed on the beginning of the world, not on time alone. I will not here be considering Kant's discussion of the limits of reason.

restatement of the argument. In his later work, Russell sometimes talks as if the argument fails for logical reasons and accuses Kant of making some elementary logical blunders. These remarks by Russell seem to have been the ones that influenced recent discussions. For instance, in a recent book on infinity, Graham Oppy restates and expands on Russell's points (Oppy, 2006:116–117).[3]

I have pointed out in an earlier paper that Philoponus's version of the argument is not merely logical. It relies on metaphysical premises. When these premises are spelt out, the argument is valid, though it may be unsound (Couvalis, 2013). Kant's version of the argument also relies on metaphysical premises, in particular, views about the nature of time and causation that are spelt out earlier in the *Critique*. Some of those premises are similar to premises in Philoponus. As we shall see, Russell's initial critique of Kant's argument was based on a metaphysical account that was radically different to that of Kant and Philoponus. Russell seems later to have forgotten that his critique is dependent on a metaphysical account. That metaphysical account involves an assumption that, following Peter Hylton, I will call **Platonic atomism**. Platonic atomism assumes the eternal, mind independent, and separate, existence of items, whether they are abstract objects, non-existent objects, or objects in the empirical world. Russell initially adopted Platonic atomism under the influence of G.E. Moore. He thought it could save philosophy from the absurdities of British idealism; for instance, the doctrines that all relations are internal and that mathematics is riddled with inconsistencies.[4]

[3] Oppy treats Kant's argument as being merely about any successive merely mathematical series. He fails to note that Kant is talking about a series in *time*, and that Kant is relying on a theory of the nature of time. Like many modern analytic philosophers who break arguments away from their context, he fails to understand what Kant means by "successive" and the like. In any case, it is now well known that Kant in the antinomies is not talking about logical necessities, but about what he thinks is necessary synthetic a priori. By contrast to recent analytic philosophers, the early Russell often shows that he knows he is arguing against complex metaphysical theories.

[4] The key paper is the now neglected Moore, 1899. Moore's paper presents an eternalist view of time six years before Einstein's Special Theory of Relativity appeared in print. For a full account of Platonic atomism, see Hylton, 1990:105–166.

Philoponus's argument and Kant's restatement

Philoponus's traversal argument in *Against Proclus* is aimed at the Neo-Platonist and Aristotelian view that that the universe is necessarily everlasting. It does not just target the specific views of the fifth century Neo-Platonist Athenian philosopher/mathematician Proclus.

Philoponus starts by stating some arguments for the claim that there cannot be actual infinities. However, he then indicates that despite these arguments, it might be thought that there could be a spatial infinity. He goes on to argue that even so, there cannot be an infinite past time:

> [F]or it would seem much more impossible to claim that the infinite is brought to actual birth bit by bit and, as it were, to be counted out one unit (monas) after another than that it exists all at once and at the same time. For if it exists all at once, perhaps there will be no need to go through it unit by unit, and actually, as it were, count it off; but if it comes to be a bit at a time and one unit always exists after another, so that eventually an actually infinite number of units has come to exist, even if it does not exist all at once at the same time because parts of it have ceased to exist while parts [still] exist, it has nevertheless become traversable, which is impossible. [But] this — I mean the traversing of the infinite by, as it were, counting it off unit by unit — is impossible, even if the counter were everlasting. For the infinite is by its nature untraversable; otherwise it would not be infinite. (Philoponus, 1899:10; 2005:24)

What is the extra impossibility to which Philoponus alludes? To understand him, consider that he has a dynamic theory of time in which equal non-zero sized units of time come into existence successively. He tells us elsewhere that time has its being in becoming and flowing.[5] As a consequence, he is saying this: If a unit of time is to exist at all, it must first be present before it is past (or ceases to exist). A later unit of dynamic time

[5] See Couvalis, 2017 for a detailed explanation of Philoponus' view of becoming and the flowing now. Philoponus does not conceive of time as an eternally given series laid out from earlier to later members of the series, a view of time which seems to have been invented in the nineteenth century.

can only come into existence if an earlier unit has come into existence (been present) before it. This means that every unit of a dynamic series time must have once been present. The units of time come into existence (and recede into the past, if they continue to exist) at a regular rate.[6] This implies that no unit of time can recede infinitely into the past (or have ceased to exist infinitely long ago). Philoponus states his argument as if we were traversing a unit at a time forwards at a uniform rate, or counting forwards at a uniform rate. This is because he thinks the now can be described as if it is moving forwards at a uniform rate. Indeed, he elsewhere tells us that time is constituted by the flow of the now. My reconstruction of the traversal argument is spelt out in an appendix at the end of this paper. I defend the reconstruction in Couvalis, 2013.

Here is Kant's version of the argument:

> For if one assumes that the world has no beginning in time, then up to every given point in time an eternity has elapsed, and hence an infinite series of states of things in the world, each following another, has passed away. But now the infinity of a series consists precisely in the fact that it can never be completed by successive synthesis. Therefore an infinitely elapsed world-series is impossible, so a beginning of the world is a necessary condition of its existence ... (Kant, 1998:470; B454)

It is important to grasp that Kant's version of the argument is stated as part of an overall argument that includes a *separate* argument against the possibility of an infinite space; an argument which relies on different premises to those he uses to argue against an infinite past time. Like Philoponus's argument, Kant's argument for a beginning of the world does not rely on his arguments about infinities in general.

We can quickly see from the reference to "successive synthesis" (successive adding on) that Kant is thinking of time as dynamic and that the underlying argument is much the same as the argument in Philoponus. Earlier remarks by Kant make clear that the argument relies on the view that the coming into being of what are now past states of things in the world is a

[6] I explain what this means, and how Philoponus can evade problems raised by McTaggart, in Couvalis, 2017.

pre-condition of the coming into being of later states of things in the world (Kant, 1998:462, B438–439; Wood, 2010:247–248). The reference to having passed away makes clear that Kant also thinks of the states as first having to be present before they pass away. This also echoes features of Philoponus's argument. Kant's view of other aspects of time is different to that of Philoponus, but that is not relevant to the merits of the argument. Kant is vaguer than Philoponus, but it is clear that the argument is much the same.

Russell's philosophical outlook

As we will see, in his early work, *Principles of Mathematics*, Russell shows that he understands that Kant's argument is based on underlying metaphysical premises about the nature of time. Indeed, as Peter Hylton has shown, much of *Principles* is intended to replace with a new account the Kantian and Hegelian account of the metaphysics of the world to which we apply mathematics. This is why *Principles* includes chapters on the philosophy of the continuum, the infinite, causation, matter and motion. Russell's preference for what might seem to be a merely logical approach to problems is actually a preference for a Platonic atomist version of Platonist metaphysics.

Russell relies explicitly on a Platonic atomist critique of Aristotelian accounts of change in giving a radical account of change when he says that:

> The notion of change has been much obscured by the doctrine of substance, by the distinction between a thing's nature and its external relations, and by the pre-eminence of subject-predicate propositions. It has been supposed that a thing could, in some way, be different and yet the same: that though predicates define a thing, yet it may have different predicates at different times. Hence the distinction of the essential and the accidental, and a number of other useless distinctions, which were (I hope) employed precisely and consciously by the scholastics, but are used vaguely and unconsciously by the moderns. Change, in this metaphysical sense, I do not at all admit. The so-called predicates of a term are mostly derived from relations to other terms; change is due, ultimately, to the fact that many terms have relations to some parts of time which they do not have to others. But every term is eternal, timeless, and immutable; the relations it may have to parts of time are equally

> immutable (Russell, 1903:sec. 443). ('Whatever may be an object of thought, or may occur in any true or false proposition, or can be counted as *one*, I call a *term*'. (Russell, 1903:sec. 47))

To see the impact of Russell's view on his solution to ancient metaphysical puzzles, consider his discussion of the use of Weierstrass's nineteenth century mathematics to solve Zeno's paradox of the arrow. Russell states the paradox as "[I]f everything is at rest or in motion in a space equal to itself, and if what moves is always in the instant, the arrow in its flight is immovable" (Russell, 1903:sec. 332). He comments that:

> Weierstrass, by banishing all infinitesimals, has at last shown that we live in an unchanging world, and that the arrow, at every moment of its flight, is truly at rest. The only point where Zeno probably erred was in inferring (if he did infer) that, because there is no change, therefore the world must be in the same state at one time as at another. (Russell, 1903:sec. 327)

As Hylton says

> [W]hat is striking here is Russell's immediate leap from mathematics to the metaphysics of change ... Platonic atomism implies an a-temporal, and therefore static, way of thinking of the world. Russell, however, claims this way of thinking is forced on us by modern mathematics, at least if we want to employ this subject to give us a consistent theory of motion. (Hylton, 1990:194)

Compared to old style Platonism, what is odd about this Platonic metaphysics is that Russell not only thinks there is a world of abstract objects; he also collapses the world of everyday reality into the world of mathematics understood in the light of modern logic. He is aware of the distinction and will sometimes admit that the underlying assumptions of mathematics might not match the real world (e.g. Russell, 1926:154ff.). More commonly Russell takes the very fact that a mathematics gives us the only available consistent picture of the world that avoids paradoxes as evidence that it is true of the world. We have leapt from the mathematical to the metaphysical.

By contrast to Russell, Plato and the ancient Neo-Platonists distinguished our world of becoming and flow from the world of the eternal paradigm,

which is truly real. On their view, the empirical world only imperfectly realised the paradigm, particularly in things that are flowing. Plato tells us that time is a moving image (*kiniton eikon*) of eternity (*aionion*), created because it was impossible (*ouk in dinaton*) for the demiurge to create an exact likeness of the eternal unity (*Timaeus*, 37d). The Neo-Platonist Damascius distinguishes between the static form of a river, and the river, which has its being in flowing and becoming (Simplicius, 1882:798, 16–20; 1992:121). Philoponus was trained in this Neo-Platonist tradition and took over some features of it into his Christianity. His version of the Christian god is a timeless being (Philoponus, 1899:6; Philoponus, 2005:22).

Russell's central criticism of the Traversal Argument[7]

Russell produces an argument against Kant's argument in *Principles* which is:

> 'Completion by successive synthesis' seems roughly equivalent to enumeration, and it is true that the enumeration of an infinite series is practically impossible. But the series may none the less be perfectly definable, as the class of terms having a specified relation to a specified term. It then remains a question, as with all classes, whether a class is finite or infinite; and in the latter alternative … there is nothing self-contradictory. (Russell, 1903:sec. 435)

His point is spelt out more clearly in his 1914 work, *Our Knowledge of the External World* (OKE), when he says:

> To begin with, it is a mistake to define the infinity of a series as 'impossibility of completion by successive synthesis'. The notion of infinity … is primarily a property of classes, and only derivatively applicable to series; classes which are infinite are given all at once by the defining property of the members, so that there is no question of 'completion' or of 'successive synthesis'. (Russell, 1926:160)

[7] Russell produces some other criticisms of the traversal argument in OKE (Russell, 1926:161). Oppy also produces similar arguments. I have dealt with such arguments as put by Richard Sorabji elsewhere (Couvalis, 2013), so I will not discuss them again here.

Consider the natural numbers starting with 0, 1, 2, 3, 4 ... We can define this bunch of numbers, by saying that it is a class in which the first member is zero and each successive member is one greater than its predecessor. We have apparently defined the series all at once.

I do not want to go further into the detail of Russell's definition of infinite series here. It is irrelevant, for Kant's argument is about a series of things in a *temporal world*. We may be able to coherently define an infinite series all at once, but that is not relevant to whether the real thing, time, is given all at once. If it comes into existence by successive synthesis (literal adding on of something that did not exist before), then what we do in defining time is misleading as to time. Russell slips from talking about the world of mathematical definition to talking about the time world. He assumes that the time world exists eternally, as if it were given all at once. On its own, his criticism is fallacious.

Russell complains in OKE about "the inveterate subjectivism" of Kant's mental habits and suggests an account of how Kant might have arrived at his argument which has no basis in Kant's text (Russell, 1926:161). However, it is Russell's inveterate Platonism that is the problem here. Using a phrase invented by German philosophers, Russell talks as if what is true of Plato Himmel — the Platonic heaven of mathematical objects — must be true of the real thing, time. Definitions of things in Platonic heaven have been converted into definitions of things in the real world.

It is odd that Russell does this in OKE, because elsewhere in the same work he shows that he is perfectly aware that what is true of mathematical representations might not be true of the actual world. Nevertheless, in *Principles* Russell shows that he has some understanding of the metaphysical background to Kant's argument. He comments that:

> [I]t seems, however, that previous events are regarded by Kant as *causes* of later ones, and that the cause is logically prior to the effect. This, no doubt, is the reason for speaking of *conditions*, and for confining the antinomy to events instead of moments. If the cause were logically prior to the effect, this argument would, I think be valid; but we shall find ... that cause and effect are on the same logical level. (Russell, 1903:sec. 435)

Russell grasps that on Kant's view the coming to be of an earlier state is a necessary condition for the coming to be of a later state. However, he

misleadingly describes it as a logical priority, thereby squeezing it into a timeless logical relation as if it could not be something different. In fact, it is clear from Kant's discussion that Kant thinks of the necessity not as logical, but as synthetic a priori. For Kant, logic is analytic. Note also that an earlier state is not a cause per se if we mean by "cause" a sufficient condition, the activity of some causal power, or an inus condition.[8] It is unlikely that Kant would have accepted that necessary conditions as such are causes. I do not know of a thorough discussion of causation in Philoponus, but it is hard to believe that he would have accepted that necessary conditions are causes per se.

Russell on causation

Russell intends his analysis of causation to be an important part of the underlying argument against Kant. By the time he wrote OKE, he seems to have forgotten that an important part of his critique of the traversal argument is his account of the nature of causation. It is presented as if it were a merely logical argument. As we have seen above, the merely logical argument is toothless, for the way in which we define series need have nothing to do with the way in which they come into existence.

My next quote from Russell will indicate that he presented a claim about causation which was meant to underlie his critique of Kant.[9] It is worth explaining that claim in a little detail so that we can understand Russell's metaphysical assumptions better. In *Principles*, Russell states a principle which he says is vital to dynamics. The principle is:

> that cause and effect are equal … All equations, at bottom, are logical equations, *i.e.* mutual implications; quantitative equality between variables, such as cause and effect, involves a mutual formal implication. Thus the principle in question can only be maintained if cause and effect are placed on the same logical level, which, with the interpretation we were compelled to give to causality, it is no longer possible to do. (Russell, 1903:sec. 473)

[8] For an account of inus conditions, see Mackie, 1974:62.

[9] Gottlind (1952) and Trainer (2008) point out that Russell drew back from his radical claims about causation in his later work. He allowed that "cause" had a legitimate use. I am here talking about his very influential early work produced 1900–1914.

Russell's central claim can be put by saying that the ordinary notion of causation ("the interpretation we were compelled to give to causality") is an unscientific one. Scientific laws are at the centre of science. Laws do not have a direction of causation built into them. From current states of the world we can calculate what past states of the world are like just as from present states we can calculate future states. This claim can be put more clearly by saying that there is in reality nothing more to causation than what is involved in formal implications that go in both directions in time. Those formal implications are to be cashed out in the logic invented by Frege and Russell (now misleadingly called "classical logic").

The point is put more clearly in a 1913 essay in which Russell tries to state the correct version of the law of causality which he thinks underlies science, when he says that:

> [T]he law makes no difference between the past and the future: The future 'determines' the past in exactly the same sense in which the past 'determines' the future. The word 'determine', here, has a purely logical significance: a certain number of variables 'determine' another variable if that other variable is a function of them. (Russell, 1992:203)

Russell's reliance on logical considerations is brought out further when he criticises the argument that the past is different from the future because we cannot change the past, but can bring about the future. He says:

> We all regard the past as determined simply by the fact that it has happened; but for the fact that memory works backward and not forward, we should regard the future as equally determined by the fact that it will happen … You cannot make the past other than it was — true, but this is a mere application of the law of contradiction … But also you cannot make the future otherwise than what it will be; this again is an application of the law of contradiction. (Russell, 1992:206)

Russell takes it as obvious that the law of contradiction applies to the future despite the fact that there are well known arguments going back to Aristotle that it does not (e.g. Aristotle, *On Interpretation*, ix). If the past is fixed, it is not obvious that it is fixed merely because of the law of non-contradiction rather than because events in it have already happened. Russell assumes logical or mathematical laws are explanatory of features of the world. Because Russell takes it that non-contradiction is logically basic, he thinks it cannot be testable through what we find out about the world. It

must apply to all the world — past, present, and future. This seems to be in serious tension with his professed empiricism. Similarly, at the start of *Principles*, he tells us that he is dealing with pure mathematics and hence with hypotheticals, but then he turns to telling us that he is dealing with space, time and motion — which are real things (Russell, 1903:secs 1 & 2).[10]

Russell also treats the way memory works as if it is an unexplainable accident. However, an obvious explanation of why memory works that way is that evolution has wired us that way to aid our survival because the future depends on our actions in a way that the past does not. The scientific principle of evolution by natural selection arguably has a non-eternalist assumption built into it. Russell ignores the obvious explanation because the only science that counts in his discussion of causation is a narrowly logical interpretation of mathematical physics.

It is striking that Russell quickly assumes that all there is to causation must be captured by logical features of the equations. He does plausibly argue that some common-sense views and Bergson's view about causation don't adequately explain what happens in physics, but those are the only views he considers. Why should we assume that all that is going on in causation is what is captured by the equations? After all, the two sides of the equations refer to items in the world which have their own properties, and many equations refer to time. Why does Russell not consider in detail whether it is the case that the properties of these items and of time might include features not captured by these equations? As far as I can tell, he does

[10] In the second edition (1938) introduction to *Principles* Russell says that in his definition of pure mathematics he wanted to include both Euclidean and Non-Euclidean geometry without saying whether the axioms are true (Russell, 1938:vii). Yet much of the text assumes he is telling us about real space, real scientific laws etc. while remaining non-committal about some axioms. The mathematics of *Principles* is thus far from pure. It is more like Kant's synthetic a priori principles, which Kant thinks cannot be brought into serious doubt. As Hylton points out, at the time of writing *Principles*, and for some time later, Russell did think mathematics and logic are synthetic a priori (Hylton, 1990:161–161, 197–198). Russell (1937:18–19) presents the key argument for the claim. Despite his attempts to escape from the influence of German and British idealism, Russell displays the influence of Kant when he assumes, synthetic a priori, that classical logic necessarily applies to everything, past, present, and future.

not consider these things because he is a Platonic atomist, not because the equations themselves compel this interpretation.[11]

Russell gave up aspects of Platonic atomism in his later work. By the time he wrote OKE (1914), he no longer regarded non-existent objects as things which have being in a Platonic realm. He also seems to have given up the view by then or soon after that there is a logico-mathematical realm with which we are acquainted. However, he does not seem to have changed his eternalist view of existents and time, or his tendency to assume that what is true of the ways in which we define things in logic or mathematics is true of the world if it produces the only available consistent picture of the world. In this way, he continued to be a kind of Platonist despite changes in his other views. This is why I would still call him a Platonist.

His comments in the introduction to the second (1938) edition of *Principles* indicate his attitude.

> The doctrines of Pythagoras, which began with arithmetical mysticism, influenced all subsequent philosophy and mathematics more profoundly than is generally realised. Numbers were immutable and eternal, like the heavenly bodies; numbers were intelligible: the science of numbers was the key to the universe … Consequently, to say that numbers are symbols which mean nothing seems a horrible form of atheism. At the time when I wrote the 'Principles', I shared with Frege a belief in the Platonic reality of numbers, which, in my imagination, peopled the timeless realm of Being. It was a comforting faith which I later abandoned with regret. (Russell, 1938:ix–x)

Russell abandoned parts of his "comforting faith", but in very influential works like OKE, he retained parts of his eternalist Platonic atomism. Arguably, this has continued to influence criticisms of Philoponus's traversal argument in modern times. This is not only true of criticisms of the traversal argument. For example, solutions to Zeno's paradoxes often presented by philosophers involve the assumption that time consists of instants and space consists of points because standard accounts of calculus include points and instants (e.g. Grunbaum, 1967). Russell, unlike some later philosophers, was very well aware that there might not be points and

[11] Nancy Cartwright has argued in a number of works that causal notions are essential to science. See, for instance, Cartwright, 1994. Mathias Frisch has recently argued that real physics, as opposed to philosophical caricatures of physics, is riddled with causal claims (Frisch, 2014). I have no space to discuss his claims here.

instants. He struggled with the fact that it seems to be impossible to tell whether there are such things. He tried to deal with the problem in a way that was consistent with his empiricism (e.g. Russell, 1926:119ff.).

Why does logic-influenced philosophy often assume aspects of Platonic atomism? One reason is the influence of the view that the real world, as opposed to the world of appearance, must be consistent because it must be coherent and completely determinate. This view may be present in Parmenides, but it is more clearly there in Plato's critique of Heraclitus, Cratylus and Protagoras in the *Theaetetus*.[12] A related reason is found in Plato's view that geometry gives us the complete truth unlike the flowing world of appearance (*Republic*, 526cff.). Perhaps Russell is right in thinking that his view of mathematics originates in Pythagoras. It is much more clearly there in Plato. For the Anglo-Hegelians that taught Russell, the absolute is the only thing that is fully consistent, and hence the only thing that is fully real. Even mathematics does not deal with eternal truths. In the tradition they inherited from Plato via Hegel, it was assumed that our everyday world is not consistent and, in some sense, not fully real. Russell turned this around by arguing that nineteenth century German mathematics was not only useful and precise, but the key to the everyday world. In this way, he treated mathematical formalisms as if they were the key to reality despite the fact that he was always aware that they might not be. Like Plato and his Anglo-Hegelian predecessors, he continued to assume that consistency is a key to true reality. His logico-mathematical eternalism is, indeed, a footnote to Plato.[13] However, as he sometimes recognised in his less Platonic and more empiricist pronouncements, the fact that a mathematical theory is the only consistent and paradox free theory available is not a sufficient ground for thinking that it is true. He could not rule out the possibility that another consistent theory might become available, and he could not countenance as a possibility that an inconsistent theory might be the key to reality.

[12] Most importantly at 177c–183c.

[13] "The safest general characterization of the European philosophical tradition is that it consists of a series of footnotes to Plato" (Whitehead, 1979:39).

Conclusion

We have seen that Russell's critique of Philoponus' traversal argument in its Kantian form is toothless without a metaphysical background in which time is treated as eternal. Russell realised that he needed this metaphysical background when he was writing parts of *Principles* but seems to have forgotten it later. We cannot adequately judge the merits of the traversal argument without assessing temporal eternalism, and I have no space to do that here. I have, however, shown that a purely logical critique of the traversal argument is toothless and that to properly assess the argument we need to assess temporal eternalism.

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Appendix – Analysis of Philoponus's argument

1) Time consists of equal non-zero size time units (monades).

2) If a dynamic theory of time is true, time has come into existence successively as a series of monades.

3) If a dynamic theory of time is true, each unit of time (except a first unit) can only come into existence when its predecessor has come into existence before it.

4) A dynamic theory of time is true.

5) There cannot exist a present member of an infinite series of time units in which each member, past and present, could only come into existence after its predecessor has come into existence ("after" is here used in the dynamic theory sense). (Inferred from premises 1 to 4 plus the meaning of "infinite").

6) No unit of time can come into existence that has an infinite series of units pre-ceding it coming into existence in succession before it. (Inferred from premises 1 to 5).

7) All units preceding a present unit are past units that came into existence in succession before it.

8) A present unit exists. Thus,

9) there cannot be an infinite number of past units.

It can be seen from various remarks I have quoted that Russell accepts premise 5. Further, in a discussion of Zeno, he explicitly says "[I]f you set to work to count the terms in an infinite collection, you will never have completed your task" (Russell, 1926:187).[14]

[14] It is interesting to note that, given his preferred metaphysics, Russell is wrong in this claim. If time is laid out eternally, there is no reason why it should not include an immortal counter who counts in monades all the natural numbers from a particular date. Suppose the counter counts at a rate of a second per second. The series of his countings, which exists eternally, would be in a one to one correspondence to the series of natural numbers with no number missing. Of course, there would be no end to the series, but all the natural numbers would be counted. Russell seems to have slipped into thinking of time as dynamic in the remark I quote.